REMARKS

Claims 1–12 and 26–46 are now pending.

Restriction Requirement

In response to the Examiner's restriction requirement, Applicant affirms the election of claims 1–16 and 26–31. Claims 17–25 are canceled as directed to a non-elected invention, but Applicant reserves the right to resubmit those claims in a divisional application.

Allowed Claims 7–12

Claims 7–12 were allowed in the previous office action.

Claims 9–11 are now amended merely to change the parent claim on which they are dependent from claim 8 to claim 7. Since claims 7 and 8 were both allowed, dependent claims 9–11 remain allowable.

Claim 7 is now amended to delete the paragraph reciting a gas inlet. The gas inlet is unnecessary to define the invention, which is directed to an exhaust channel deflector and a magnet. Therefore, claim 7 and dependent claims 8–12 remain allowable.

Claims 1, 2, 4–6 and 26–31

Claims 1, 2, 4–6, 26, 27 and 29–31 were rejected under 35 USC 102(e) as anticipated by Loewenhardt 6,030,486. Claim 28 was rejected under 35 USC 103 as unpatentable over Loewenhardt.

Applicant states that the subject matter of Loewenhardt 6,030,486 and the present invention were commonly owned at the time the present invention was made. Therefore, Loewenhardt is not prior art against the present application under 35 USC 103. However, Applicant directs the Examiner's attention to the European counterpart to Loewenhardt, EP 0 786 794 A2, published July 1997, which is prior art against the present application under 35 USC 103. This European publication was cited in Applicant's I.D.S. filed 10/15/01.

Claim 1 is now amended to recite a protrusion extending from the first wall of the exhaust channel into the exhaust channel so as to reduce the transverse width of the exhaust channel adjacent the protrusion. The claimed invention is advantageous because reducing the transverse width of the exhaust channel helps quench any plasma in the exhaust channel by increasing the rate of collisions

and recombination of charged particles. Furthermore, the protrusion will block the axial path of some of the exhaust gas and thereby laterally deflect some of the exhaust gas, further increasing the rate of collisions and recombination.

The Examiner cited Loewenhardt as disclosing a deflector in the center of the exhaust channel. However, Loewenhardt fails to disclose or suggest a protrusion extending from a wall of the exhaust channel. Therefore, independent claim 1 and dependent claims 2 and 4–6 are patentable over Loewenhardt.

Method claim 26 is now amended to recite "positioning a deflector within the exhaust channel so as to transversely deflect a substantial portion of said gas flow through the exhaust channel." This is the same feature on which the Examiner based the allowability of apparatus claim 7. Loewenhardt fails to disclose or suggest a deflector that transversely deflects a substantial portion of the exhaust gas. Therefore, claim 26 and dependent claims 27–31 are patentable over Loewenhardt.

Newly Added Claims 32–39

Newly added claims 32–36 are patentable because they are dependent on the claims just discussed.

Newly added claim 37 is a method counterpart to apparatus claim 7. Therefore, method claim 37 is allowable for the same reasons that claim 7 was allowed. Claims 38 is allowable because it is dependent on claim 37.

Newly added claim 39 is a method counterpart to apparatus claim 1, hence it is allowable for the same reasons that claim 1 is allowable, as argued above. Claims 40–44 are allowable because they are dependent on claim 39.

Claims 3, 45 and 46

Apparatus claim 3 is now rewritten in independent form. In addition, claim 3 is amended to further distinguish the prior art by reciting a magnetic field strength of at least 100 gauss in the exhaust channel. Newly added claims 45 and 46 are corresponding method claims.

More specifically, claims 3 and 45 are directed to a magnet system adjacent the exhaust channel having a strength that declines from at least 100 gauss at a position in the exhaust channel to no more than 5 gauss at the substrate position. The high magnetic strength in the exhaust channel is advantageous to block the plasma, while the low magnetic strength at the substrate position is

advantageous to minimize the risk of damage to the substrate. Claim 46 is similar, but its strength in the exhaust channel is defined as great enough to block the plasma from reaching the exhaust aperture.

The Examiner rejected claim 3 under 35 USC 103 as unpatentable over Loewenhardt. (Please see Applicant's statement above regarding the European counterpart of Loewenhardt being prior art under 35 USC 103.) The Examiner asserted it would be obvious to minimize the disturbance of the substrate by attenuating the magnetic field to less than 5 gauss the substrate location. However, the Examiner failed to cite any prior art that would motivate creating a magnetic field that declines from 100 gauss (or in claim 46, a strength high enough to block the plasma) to 5 gauss between the exhaust channel and the substrate. Absent such motivation in the prior art itself, claims 3, 45 and 46 are patentable.

Respectfully submitted,

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Marked-Up Copy of Amended Claims 1, 7, 9–11 and 26

1. (twice amended) A plasma chamber comprising:

a vacuum chamber enclosure enclosing a chamber interior;

[a gas inlet aperture through which gas can be admitted into the chamber interior;]

an exhaust aperture through which gas can be exhausted from the chamber interior;

an exhaust channel extending between the chamber interior and the exhaust [pump] aperture so as to provide a path for gas flow from the chamber interior to the exhaust aperture, wherein the exhaust channel includes:

a channel inlet aperture in fluid communication with the chamber interior,

a channel outlet aperture in fluid communication with the exhaust aperture, and

at least a first wall that extends between the channel inlet aperture and the channel outlet aperture;

a protrusion extending from the first wall of the exhaust channel into the exhaust channel so as to reduce the transverse width of the exhaust channel adjacent the protrusion; and

[a deflector positioned within the exhaust channel so as to create turbulence in said gas flow through the exhaust channel; and]

a magnet system having north and south magnetic poles positioned adjacent the [deflector] protrusion.

3. (amended) A plasma chamber [according to claim 1, further] comprising:

a vacuum chamber enclosure enclosing a chamber interior;

an exhaust aperture through which gas can be exhausted from the chamber interior;

an exhaust channel extending between the chamber interior and the exhaust aperture so as to provide a path for gas flow from the chamber interior to the exhaust aperture;

a magnet system positioned adjacent the exhaust channel; and

a chuck for holding a substrate at a substrate position within the chamber interior;

wherein the magnet system is positioned far enough from the substrate position so that the magnet system [does not produce] produces a magnetic field that declines from at least 100 gauss at one position in the exhaust channel to no greater than 5 gauss at the substrate position.

7. (twice amended) A plasma chamber comprising:

a vacuum chamber enclosure enclosing a chamber interior;

[a gas inlet aperture through which gas can be admitted into the chamber interior;]
an exhaust aperture through which gas can be exhausted from the chamber interior;
an exhaust channel extending between the chamber interior and the exhaust aperture so as to provide a path for gas flow from the chamber interior to the exhaust aperture;
a deflector positioned within the exhaust channel so as to transversely deflect a substantial portion of said gas flow through the exhaust channel; and
a magnet system having north and south magnetic poles positioned adjacent the deflector.

9. (twice amended) A plasma chamber according to claim [8] 7, wherein:
the north and south magnetic poles are spaced apart along said gas flow path of the exhaust channel.

10. (twice amended) A plasma chamber according to claim [8] 7, wherein the magnet system produces a magnetic field strong enough to block plasma from extending from the chamber interior through the exhaust channel beyond the protrusion.

11. (amended) A plasma chamber according to claim [8] 7, further comprising:
a chuck for holding a substrate at a substrate position within the chamber interior;
wherein the magnet system is positioned far enough from the substrate position so that the magnet system does not produce a magnetic field greater than 5 gauss at the substrate position.

26. (twice amended) A method of preventing plasma within a plasma chamber from extending completely through the exhaust channel of the chamber, comprising the steps of:
providing a vacuum chamber enclosure that encloses a chamber interior;
admitting a gas into the chamber interior;
providing an exhaust channel extending between the chamber interior and an exhaust aperture so as to provide a path for gas flow from the chamber interior to the exhaust aperture;
positioning a deflector within the exhaust channel so as to [create turbulence in] transversely deflect a substantial portion of said gas flow through the exhaust channel; and
creating a magnet field within the exhaust channel [having a substantial component that is transverse to said gas flow path].